CLAIMS

What is claimed is:

1. A system for enabling a user to create on a computer workstation a visually displayed architectural description of a computer simulation of a real system comprising:

   a. a standardized set of graphical node elements representing each of a plurality of pre-defined real system components, the real system components including processes and real system hardware associated with the real system;

   b. a standardized set of graphical arc elements representing each of a plurality of pre-defined timing, control, and data relationships that can be associated with the pre-defined real system components;

   c. each of the graphical node elements and arc elements displayed at a graphical user interface on the workstation and selectable by the user whereby the user can position selected node elements in a user-defined arrangement and connect two or more of the selected node elements with one or more selected arc elements to create on the workstation the architectural description of the simulation of the real

system;

d. a parameter data input window associated with at least some of the selected node and arc elements, the parameter data input window allowing the user to associate parameter data with the selected node and arc elements; and

e. simulation architecture data files describing:

the selected node and arc elements,

the user defined arrangement of the node and arc elements, and

the parameter data input by the user.

2. The system of claim 1 wherein the real system components represented by the standardized set of node elements include external hardware devices, periodic processes, aperiodic processes, and continuous processes.

3. The system of claim 2 wherein the standardized set of node elements further includes at least one simulation container representing in a single graphical node element a plurality of the real system components.

4. The system of claim 3 wherein the standardized set of node elements further includes a boundary node.

5. The system of claim 1 wherein the pre-defined timing, control, and data relationships represented by the standardized set of graphical arc elements include data transfer between processes, synchronization between processes, and synchronization with data transfer between processes.

6. The system of claim 5 wherein the standardized set of graphical arc elements further includes a communications container representing in a single graphical arc element a plurality of the timing, control, and data relationships.

7. The system of claim 5 wherein the synchronization relationship represented by one of the arc elements defines a synchronization mechanism between a first node element representing a source process and a second node element representing a destination process, and the parameter data that can be linked to the arc elements representing a synchronization mechanism includes a sync release time relative to an execution time of the source process and a sync frequency.

8. The system of claim 7 wherein the source and destination processes connected by an arc element representing a synchronization mechanism can each be periodic, aperiodic, or continuous.

9. The system of claim 8 wherein the synchronization mechanisms associated with an arc element selected by the user are tested for selection of an illegal synchronization relationship between node elements selected by the user.

10. The system of claim 9 wherein the illegal synchronization relationships tested by the system include:

a. connecting a periodic source process to a periodic destination process with an arc element representing an aperiodic synchronization mechanism;

b. connecting an aperiodic source process to a periodic destination process with an arc element representing a synchronization mechanism; and

c. connecting to a single process with multiple arc elements defining different synchronization mechanisms.

11. The system of claim 1 further comprising an output file generator operable to select and organize pre-defined portions of the simulation architecture data files into an electronic output file that can be used for generating computer code defining a computer simulation corresponding to the architectural description created by the user on the workstation.

12. A method of creating on a computer workstation a graphical description of the architecture of a simulation of a real world system comprising the steps of:

a. selecting at a graphical user interface one or more graphical node elements from a standardized set of graphical node elements displayed on the workstation, the selected node elements representing pre-defined real system components, including processes and real system hardware, associated with the real system;

b. selecting at the graphical user interface one or more graphical arc elements from a standardized set of graphical arc elements displayed on the workstation, the selected arc elements representing pre-defined timing, control, and data relationships between the selected node elements;

c. arranging on the graphical user interface the selected node elements and connecting the selected node elements with the selected arc elements to create and display on the workstation the architectural description of the simulation of the real system;

d. entering at one or more parameter data input windows associated with at least some of the selected node and arc elements

parameter data that further defines properties of the selected node and arc elements found in the real world system; and

e. saving, in one or more simulation architecture data files, data about the selected node and arc elements, data about the user defined arrangement of the node and arc elements, and the parameter data input by the user.

13. The method of claim 12 further comprising the step of generating an output file containing selected portions of the simulation architecture data files.

14. The method of claim 12 wherein the real system components represented by the standardized set of node elements include external hardware devices, periodic processes, aperiodic processes, and continuous processes.

15. The method of claim 14 wherein the standardized set of node elements further includes at least one simulation container representing in a single node element a plurality of the real system components.

16. The method of claim 15 wherein the standardized set of node elements further includes a boundary node.

17. The method of claim 12 wherein the pre-defined timing, control, and data relationships represented by the standardized set of arc elements include data transfer between processes, synchronization between processes, and synchronization with data transfer between processes.

18. The method of claim 17 wherein the standardized set of arc elements further includes a communications container representing in a single arc element a plurality of the timing, control, and data relationships.

19. The method of claim 17 wherein the synchronization relationship represented by one of the arc elements defines a synchronization mechanism between a first node element representing a source process and a second node element representing a destination process, and the parameter data that can be associated with the arc elements representing a synchronization mechanism includes a sync release time relative to an execution time of the source process and a sync frequency.

20. The method of claim 19 wherein the source and destination processes connected by an arc element representing a synchronization mechanism can each be periodic, aperiodic, or continuous.

21. The method of claim 20 further comprising automatically testing the synchronization mechanisms associated with selected arc elements for use of an illegal synchronization relationship between selected node elements.

22. The method of claim 21 wherein the illegal synchronization relationships tested include:

a. connecting a periodic source process to a periodic destination process with an arc element representing an aperiodic synchronization mechanism;

b. connecting an aperiodic source process to a periodic destination process with an arc element representing a synchronization mechanism; and

c. connecting to a single process with multiple arc elements defining different synchronization mechanisms.

23. The method of claim 13 further comprising organizing data in the output file for use in generating computer code defining a computer simulation corresponding to the architectural description created by the user on the workstation.

24. A system for creating a graphical representation of the architecture of a computer simulation of a real world system comprising:

a. a computer workstation having a processor, display, keyboard, an operating system causing the processor to generate a cursor on the display, a pointing device for manipulating the cursor on the display, and a data storage device;

b. a first software module operable to generate a graphical user interface on the display;

c. a second software module operable to display on the graphical user interface a pre-defined set of graphical node elements, the node elements representing pre-defined real system components, the real system components including processes and real system hardware associated with the real system;

d. a third software module operable to display on the graphical user interface a pre-defined set of graphical arc elements, the arc elements representing pre-defined timing, control, and data relationships that can be associated with the real system components;

e. the second software module further operable to allow the user, using the pointing device, to select one or more of the node elements and position the selected node elements in a user-defined arrangement on the

display corresponding to the simulation architecture;

f. the third software module further operable to allow the user, using the pointing device, to select one or more of the arc elements and position the selected arc elements on the display to connect the selected and positioned node elements so as to associate one of the pre-defined timing, control, and data relationships with the node elements connected by the selected arc elements;

g. a fourth software module operable, in conjunction with the graphical user interface, to open parameter data input windows linked to one or more of the selected node and arc elements and receive from the user parameter data further defining properties of the linked node and arc elements; and

h. the operating system further operable to store on the data storage device simulation architecture data files containing data representing:

the selected node and arc elements,

the arrangement of the selected node elements,

the connection of the selected node elements by the selected arc elements, and

the parameter data input by the user.

25. The system of claim 24 further comprising an output file generator module operable to select and organize pre-defined portions of the simulation architecture data files into an electronic output file that can be used for generating computer code that defines a computer simulation corresponding to the architectural description created by the user on the workstation.